Chittenden County
Metropolitan Planning Organization
Technical Assistance Program

East Road / Depot Road
Colchester, Vermont

- Final Report -
April, 2002

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A. Background

East Road in Colchester, Vermont serves as an important link in the local transportation network between Colchester and Milton, providing an alternate roadway corridor instead of Route 7. Beginning in Colchester at its intersection with Route 2A in Colchester Village, the road leads north and presents a roller coaster type ride for motorists in its initial segment. The road descends into a sag vertical curve (hereinafter referred to as the "dip") and is almost immediately followed by a crest vertical curve (hereinafter referred to as the "hill"). In addition to a rather complex vertical alignment, the horizontal alignment consists of a relatively sharp curve located between the "dip" and the "hill".

At the top of the "hill", Depot Road intersects with East Road, forming a tee intersection. There is an existing stop sign along Depot Road at the intersection.

The existing posted speed limit along the roadways in this area is 30 mph. In the northbound direction, there is an existing speed limit sign along East Road just north of its intersection with Route 2A. The speed limit changes from 30 mph to 40 mph in the northbound direction approximately 0.5 miles north of the Depot Road intersection. In the southbound direction, the speed limit changes from 40 mph to 30 mph approximately 0.5 miles north of the Depot Road intersection. The 30 mph speed limit in the southbound direction continues to the Route 2A intersection.

There are a series of existing warning signs within the vicinity of the Depot Road intersection and the "dip". These signs include winding road, curve ahead, and intersection warning signs to alert motorists of the upcoming complex horizontal and vertical alignment.

Over the years, there have been numerous accidents along East Road between the "dip" and the Depot Road intersection. Some of the accidents involved multiple vehicles at the Depot Road intersection. However, many of the accidents were single vehicle accidents, involving vehicles leaving the roadway.

In an effort to improve safety along this section of East Road, the Town of Colchester requested technical assistance from the Chittenden County Metropolitan Planning Organization (CCMPO) to perform a study of the roadways in this area and develop improvement alternatives to reduce deficiencies and improve vehicular safety. Accordingly, as part of the CCMPO Technical Assistance Program, we were asked to provide the requested assistance. The text that follows presents a summary of our findings and conclusions.

B. Initial Project Meeting

An initial meeting was held between our firm, representatives from the Town of Colchester, and a representative of the CCMPO. At this meeting, the concerns of the Town were discussed. The Town staff provided a brief summary of the improvements that had been previously implemented to improve safety in this area. It was concluded at this meeting that potential improvement alternatives were to include short term and long term improvements. Short term improvements, such as signing, could be easily and economically implemented by the Town in the immediate future. Long term improvements, such as alignment changes, could be incorporated into the Town's future planning and budgets.

C. Data Collection

The data collection phases involved the collection of existing available data and the performance of field studies. The various sources of data for this study are presented below.

C.1 Existing Data Available

C.1.1 Traffic Volumes

Traffic data was obtained from the Town of Colchester. This data included traffic volume counts performed between July 3 and July 12, 2001. The location of the counter was in the "dip" along East Road between Route 2A and Depot Road. Using seasonal and growth factors obtained from the

Vermont Agency of Transportation (VTrans), the 2002 AADT for this roadway was determined to be 4,570 vehicles per day. Peak hour volumes were approximately 400 vehicles per hour for both the AM and PM peak periods. In the morning, approximately 85% of the vehicles were traveling southbound. In the evening, this trend reversed, with approximately 75% of the vehicles traveling northbound.

C.1.2 Speed Data

The Town of Colchester also provided speed study data along East Road in two locations. The first location was in the "dip" between Route 2A and Depot Road performed between June 27 and July 3, 2001. The second was located approximately 1.5 miles north of the Route 2A intersection and was performed between July 3 and July 14, 2001. A summary of the results of the speed study are summarized for both locations in Tables 1 and 2 below.

Table 1 - Speed Study Results
Location: "dip" between Route 2A and Depot Road

Speed Statistics	Northbound Traffic	Southbound Traffic
Average Speed, mph	43	42
85th Percentile Speed, mph	47	44
10 mph Pace Speed, mph	36-45	36-45
Speed Limit, mph	30	30
% Vehicles > Speed Limit	98.87%	98.18%

Table 2 - Speed Study Results
Location: Approximately 1½ miles north of Route 2A

Speed Statistics	Northbound Traffic	Southbound Traffic
Average Speed, mph	50	45
85th Percentile Speed, mph	54	49
10 mph Pace Speed, mph	46-55	41-50
Speed Limit, mph	40	40
% Vehicles > Speed Limit	95.96%	85.47%

C.1.3 Accident Data

Accident data was obtained from the Town of Colchester within the project area. For the period from January 1997 through November 2001, there were a total of 14 accidents at or near the Depot Road intersection. Approximately 70% of these 14 accidents were single vehicle accidents that primarily occurred in the "dip". The remaining 30% were multiple vehicle accidents that primarily occurred at the Depot Road intersection.

C.2 Field Studies

In order to identify the existing horizontal and vertical roadway and intersection geometry, a limited topographic field survey was performed. Sufficient information was collected to develop a base plan for use in the development of potential improvement alternatives and to identify the significant impacts associated with each alternative. Prior to the field survey work, members of the study team visited the site on two occasions to gain an understanding of the existing conditions and confirm areas of study focus.

In addition to the field survey work, sufficient record research was performed to identify the approximate limits of the existing right-of-way along East Road. This information was in turn incorporated into the base plan. A copy of the base plan is presented in Figure 1 in the Appendix A.

D. Existing Deficiencies

In reviewing all of the data collected, a number of existing deficiencies were identified along East Road within the study area. Each of these deficiencies is discussed below.

D.1 Vehicle Speeds

The existing posted speed limit along East Road in this area is 30 mph. The results of the speed studies performed by the Town of Colchester indicate that over 98% of all vehicles are exceeding the posted speed limit.

In most cases, speed limits along roadways are set at the 85th percentile speed as determined by a speed study along the roadway in question. However, special conditions may dictate the need for a speed limit less than the 85th percentile speed, such as roadway geometry, land use, etc. In no case should a speed limit be posted that exceeds the design speed of the roadway and more commonly the maximum speed limit is posted at 5 mph less than the design speed of a roadway.

Normally, a speed study would not be performed at locations of complex roadway geometry, such as at the bottom of hills, on sharp curves, etc. In order to measure the uninhibited speed vehicles are traveling, the study should be taken in locations of consistent roadway conditions, ideally along a straight and level section of roadway. In this case, the speed study data was collected in the "dip". Although this is not an ideal location, we feel that it may be appropriate as it does provide information on the speed vehicles are traveling though the complex section of roadway.

D.2 Horizontal Geometry

The existing horizontal curve has approximately a 500 foot radius. In addition, the curve is superelevated at ±4%. Based on these parameters, the design speed for this curve is 35-40 mph. Typically, a roadway with a design speed of 35-40 mph would have a posted speed limit of 30-35 mph. Therefore, the existing posted speed limit is satisfactory for the horizontal curvature of the roadway in this area.

Horizontal Curve - Southbound on East Road

However, the horizontal alignment of a roadway must be considered in conjunction with the vertical alignment; which is discussed below.

D.3 Vertical Geometry

As East Road leads north from Route 2A, the roadway has a ±11.5% downgrade, a ±500 foot long sag vertical curve, followed by a ±11.5% upgrade. Based on AASHTO design standards, the maximum allowable grade for a 35 mph design speed is 10% for a collector roadway. In addition, the Town of Colchester regulations do not permit roadway grades in excess of 10%.

One important design control for sag vertical curves is the headlight sight distance of a vehicle. The design length of a sag vertical curve is chosen such that the headlight beam of the vehicle is equal to the stopping sight distance for a vehicle at the design speed. For a design speed of 35 mph, the recommended vehicle stopping sight distance is 250 feet.

The existing sag vertical curve, which forms the "dip" on East Road, has a design speed of 20 mph and provides a sight distance of approximately 138 feet; which is significantly less than the minimum stopping sight distance of 250 feet at the 35 mph design speed.

Almost immediately following the sag vertical curve, motorists encounter a ±310 foot long crest vertical curve (the "hill") with a ±11.5% upgrade and ±4.5% downgrade entering and exiting tangents respectively. As discussed above, the maximum grade that would normally be accepted along this type of roadway is 10%.

Crest Vertical Curve – Northbound on East Road

Crest Vertical Curve – Southbound on East Road

Similar to sag vertical curves, the primary design control for crest vertical curves is sight distance. The length of the curve is chosen to provide the minimum stopping sight distance for the design speed. The existing crest vertical curve along East Road has a design speed of 30 mph and provides a sight distance of approximately 205 feet. This vertical curve meets the design criteria for the 30 mph posted speed limit, but not a 35 mph design speed.

D.4 Intersection Sight Distance

In the context of intersections, there are two types of sight distance of interest; stopping sight distance and intersection (or corner) sight distance.

Stopping sight distance has been referred to above, but not specifically defined. Simply put, stopping sight distance is the distance traveled by a vehicle from the instant a hazard is recognized by the driver to the time that the vehicle stops. This is an absolute minimum value that should be provided on the basis of safety. For a 35 mph design speed, the minimum stopping sight distance is 250 feet.

Intersection sight distance on the other hand is based on driver comfort and convenience. This distance allows the driver of a stopped vehicle to enter the roadway and complete the desired movement (left, right, or straight), without unduly interfering with approaching vehicles. For a 35 mph design speed, the minimum intersection sight distance is 390 feet for left turning vehicles and 335 feet for right turning vehicles from the minor road.

During the field studies, the existing available stopping and intersection sight distance from Depot Road was measured. The existing available stopping and intersection sight distance from Depot Road to the north was measured to be 400 feet, although the existing trees along the east side of East Road did produce "blind spots". To the south from Depot Road (over the "hill"), the available stopping and intersection sight distance was measured to be 186 feet and 248 feet respectively.

Depot Road Sight Distance to the South

Depot Road Sight Distance to the North

Based on the above, the existing available sight distances is acceptable to the north. However, there is neither acceptable stopping nor intersection sight distance available to the south.

D.5 Summary of Existing Deficiencies

The sag and crest vertical curves between Route 2A and the Depot Road intersection do not meet the design criteria for a 35 mph design speed (30 mph speed limit), resulting in inadequate sight distances throughout this section of roadway.

Although there are several existing warning signs present to alert motorists of the upcoming roadway conditions, the speed study results indicate that these signs are not effective in slowing vehicles throughout this area. The results show that 85% of the vehicles are traveling at 1½ times the posted speed limit in the area of the "dip" and over 98% of the vehicles are exceeding the existing posted speed limit.

Considering that the roadway geometry is insufficient for even the existing speed limit, vehicles traveling well in excess of the speed limit will have difficulty negotiating the roadway in this area. This is supported by the accident data that shows 70% of the accidents in this area were single vehicle accidents with vehicles leaving the roadway.

In addition, the vertical curvature of the roadway in the vicinity of the Depot Road intersection results in insufficient stopping and intersection sight distance to the south for vehicles exiting Depot Road. As was discussed above, the minimum stopping sight distance at the design speed must be provided for safety reasons. When this distance is not available, vehicles will not be able to stop in time to avoid an obstacle. This problem is compounded when the vehicles are traveling at excessive speeds, as in this situation. This too is supported by the accident data for multiple vehicle collisions at or near the Depot Road intersection.

E. Improvement Alternatives

There are three general existing deficiencies with the roadway between Route 2A and the Depot Road intersection; 1) excessive vehicle speeds, 2) inadequate roadway geometry, and 3) insufficient sight distance at the East/Depot Road intersection. In order to correct these deficiencies and improve safety in this area, various improvement alternatives were developed, each of which are presented below.

E.1 Short Term Improvements

Short term improvements are items that can be implemented in the immediate future at minimal cost to the Town of Colchester. We feel that safety would be significantly improved if the vehicle speeds were reduced along this section of East Road. The roadway geometry in this area is clearly not designed to accommodate the vehicle speeds that are occurring. Modifications to improve the roadway geometry are considered long term improvements and are discussed later.

Typical methods of controlling and reducing vehicle speeds involve the implementation of one or more traffic calming measures. Applicable measures in this instance may include narrowing of the roadway, speed bumps or table tops, warning signs, multi-way stop signs, and speed enforcement. Each of these measures is individually discussed below.

E.1.1 Narrowing of the Roadway

As the name implies, this technique involves the narrowing of the travel-way to present the appearance of visual obstructions to motorists, which has been shown to help reduce vehicle speeds. The narrowed area can be supplemented with landscaping to enhance the roadway appearance. However, in this case, due to the volume of vehicles using this roadway, the already narrow roadway (±11' travel lanes with minimal shoulders) should not be further narrowed. In addition, as the roadway is not currently curbed, we do not recommend the introduction of landscaping within 10 feet of the roadway edge.

E.1.2 Speed Bumps or Table Tops

This technique involves the physical construction of a raised section of roadway to produce a "bump" in the road. This "bump" forces vehicles to reduce speed when passing over the area. These devices are quite effective in reducing vehicle speeds, but only in the vicinity of the device. These devices should be located in relatively level and straight sections or roadway to prevent motorists from losing control due to the "bump". In consideration of the roadway geometry within the project area, we do not feel that these types of devices are appropriate. In order to be "safely installed", a speed bump or table top would have to be located several hundred feet north of Depot Road. This may in turn slow southbound vehicles approaching the Depot Road intersection, but it will not be effective in reducing the speed of northbound vehicles prior to Depot Road.

E.1.3 Warning Signs

The installation of a variety of warning signs in advance of roadway hazards are used to alert motorists of the upcoming roadway conditions. However, as motorists become familiar with the roadway conditions, they tend to ignore the warning signs and are able to negotiate the roadway under normal circumstances. However, when adverse conditions are present, such as fog, rain, snow, ice, and even darkness, motorists may no longer be able to negotiate the roadway at their typical speed.

There are numerous existing warning signs present throughout the study area. However, the accident data and speed study results would suggest that motorists have become familiar with roadway and ignore these important warning signs. In an attempt to remind the motorists of the existing warning signs, we recommend that bright orange flags be attached to the signs to draw attention to them. In addition to highlighting the existing warning signs, we recommend the installation of a new 25 mph "curve speed" warning sign at each end of the horizontal curve.

E.1.4 Multi-way Stop Signs

A common technique for reducing vehicle speeds is the installation of multi-way stop signs at an intersection. However, stop signs should not be indiscriminately installed and should never be used to control speeds along a roadway. The Manual On Uniform Traffic Control Devices (MUTCD) presents a series of guidelines for the installation of the stop signs. The various guidelines take into consideration accident history, vehicular, pedestrian, and bicycle volumes, intersection geometry, and other safety factors such as speed and restricted view.

The MUTCD is a document that contains standards for the design, installation, and maintenance of traffic control devices (signs, signals, markings, and other devices). In the State of Vermont, the MUTCD has been adopted as the standard to which all traffic control devices must conform on State roadways. In order to present motorists with consistent traffic control devices, this document is commonly applied to local roadways as well.

Based on our analysis of the collected data and field conditions, we find that multi-way stop signs are not supported by the MUTCD at this location. We recognize that the roadway geometry in this area is a contributing factor to the unsafe conditions. However, we believe that excessive speed is one of the primary causes of the unsafe conditions; and stop signs should never be used to control vehicle speeds. In addition, due to the steep approach grade to Depot Road for northbound vehicles, we feel that vehicles stopping at a stop sign on this approach may have a difficult time resuming operation, especially during adverse weather conditions.

E.1.5 Speed Enforcement

One of the most effective methods of reducing vehicle speeds throughout a section of roadway is a consistent and concentrated speed enforcement program. This will serve to remind motorists of the existing 30 mph speed limit in this area. The extremely consistent traffic volumes through this area

would tend to suggest that the majority of motorists along this roadway are regular commuters. Thus, we anticipate that drivers would quickly adjust their driving habits appropriately. In addition to the enforcement program, we recommend the installation of two new speed limit signs in this area.

E.1.6 Summary

Figure 2 presented in the Appendix A depicts the recommended short term improvements throughout the study area. In summary, these improvements include the following:

- Install orange flags on existing warning signs to highlight their presence
- Install two new 25 mph "curve speed" signs
- Install two new 30 mph "speed limit" signs
- Implement a consistent and concentrated speed enforcement program

E.2 Long Term Improvements

Long term improvements involve modifications to the roadway geometry (horizontal and/or vertical) to correct deficiencies and improve overall safety. These projects are often large enough to require future planning and budgeting to bring them to fruition.

The goal in developing and evaluating long term improvement alternatives was to reduce the existing deficiencies in the roadway geometry and sight distance at the Depot Road intersection, which have been previously discussed.

E.2.1 Horizontal Curvature

The first alternative considered was to make improvements to the horizontal curvature of the roadway. We have previously shown that, when considered by itself, the existing horizontal curvature of the roadway is satisfactory for the posted speed limit. However, the operation of vehicles through this curve is affected by the vertical curvature of the roadway as well.

In order to lessen the adverse effect the vertical curvature has, we considered increasing the radius of the horizontal curve; to "straighten" the roadway. However, even minor changes to the horizontal alignment of the roadway will require extensive regrading, utility relocations, and right-of-way and/or easement acquisitions. In addition, we feel that the benefits realized will be minimal and may even contribute to the existing problems. What is meant by this is that an increase in the radius of the curve will result in a higher design speed and the appearance of a "straighter" roadway for the motorists; which may lead to motorists not feeling the need to reduce their speed and may even result in higher speeds.

One improvement to the horizontal curve that is recommended is an increase in the superelevation rate of the curve. The existing curve is superelevated at a maximum of approximately 4%. We recommend that this be increased to a maximum of 6%. It is understood that superelevating a curve results in an increase in design speed and may result in an increase in running speeds. However, we feel that the benefit of the increased superelevation will help motorists maintain control through the curve.

E.2.2 Vertical Curvature

The second alternative considered was to make improvements to the vertical curvature of the roadway. We have previously shown that the two vertical curves present in the study area do not meet the design criteria for a 35 mph design speed (30 mph speed limit). Improvement alternatives to each vertical curve are separately discussed below.

E.2.2.1 Sag Vertical Curve

The existing sag vertical curve is approximately 500 feet in length with a calculated design speed of 20 mph and provides a sight distance of 138 feet; well below the recommended 250 feet for a 35

mph design speed. In order to satisfy the design criteria for the 35 mph design speed, with the existing entering and existing tangent grades, the length of this curve would need to be increased to approximately 1,100 feet. This would result in the roadway surface at the "dip" being raised approximately 18 feet.

We also considered changes to the entering and exiting tangent grades for this curve. The entering tangent grade is limited by the existing driveway located on the west side, approximately 150 feet prior to the "dip". This reduces the magnitude of potential safety improvements that may be obtained with modifications to this vertical curve.

Similar to the horizontal curvature improvements, any modifications to the tangent grades or length of the sag vertical curve will require extensive regrading, utility relocations, right-of-way and/or easement acquisitions, and impacts on the wetlands on either side of the sag vertical curve. Unless the modifications result in a vertical curve meeting the design criteria for a 35 mph design speed, we feel that the benefits realized will be minimal and overshadowed by the extensive impacts.

E.2.2.2 Crest Vertical Curve

The existing crest vertical curve is approximately 310 feet in length with a calculated design speed of 30 mph and provides a sight distance of 205 feet. Although this curve meets the design criteria for the 30 mph posted speed limit, it does not meet the criteria for a 35 mph design speed. In addition, it is the crest of this vertical curve that limits the available sight distance for vehicles at the Depot Road intersection.

Accordingly, we have developed an improvement alternative to lower the crest of this vertical curve. This involves reducing the exiting tangent grade from approximately –4.5% to approximately –2.0% and constructing a 400 foot long crest vertical curve. This results in the lowering of the East Road centerline approximately 3½ feet at the crest of the hill. The design speed for this new vertical curve is 35 mph and it will provide 250 feet of sight distance.

With the improvements to the crest vertical curve described above, the available sight distance for vehicles at the Depot Road intersection will also be improved. With the improvements, the available stopping sight distance will increase from the measured 186 feet to ±250 feet; which meets the criteria for a 35 mph design speed. Also, the available intersection sight distance will increase from the measured to the 248 feet to ±286 feet; which only meets the design criteria for a 25 mph design speed. This is the reasoning behind the short term improvement recommendation of installing the 25 mph "curve speed" signs. It is also important to note that while the stopping sight distance is a minimum value that must be provided, the intersection sight distance is based on comfort and convenience of motorists.

There is an existing waterline the runs along the east side of East Road throughout the study area. As a result of the lowering of East Road by approximately 3½ feet, the existing waterline will be left with insufficient cover over the pipe to prevent freezing. Accordingly, a new waterline will have to be installed parallel to the existing waterline at a minimum depth over the pipe of 6 feet in the area of the road work. The new waterline will then be connected to the existing waterline; which in turn will be capped and abandoned.

As Depot Road approaches East Road, its grade will have to be modified to adjust for the 3½ foot lowering of East Road. In addition, there is one existing driveway that will have to be adjusted to tie into East Road. With the exception of construction easements for the modifications to the existing driveway across from Depot Road and some drainage work south of Depot Road, all of the roadway improvement can be constructed within the existing rights-of-way.

E.2.3 Summary

Figure 3 presented in the Appendix A depicts the recommended long term improvements described above.

F. Conceptual Cost Estimates

Table 3 below presents conceptual cost estimates for the short term and long term roadway improvements. All of the estimates assume that the projects would be constructed this construction season. Copies of the cost estimate breakdowns are presented in Appendix B.

Table 3 Conceptual Cost Estimates	Short Term Improvements	Long Term Improvements
Construction Cost	$ 1,140	$ 208,000
Engineering Design	$ ----	$ 14,560
Construction Services	$ ----	$ 6,240
Total Estimated Cost	$ 1,140	$ 228,800

G. Preliminary Permit Assessment

At the initial project meeting, the Town indicated a desire to include information regarding the potential permit issues that may be related to various improvement alternatives. Accordingly, presented below is a discussion of potential permit issues for both the short term and long term roadway improvements.

G.1 Short Term Improvements

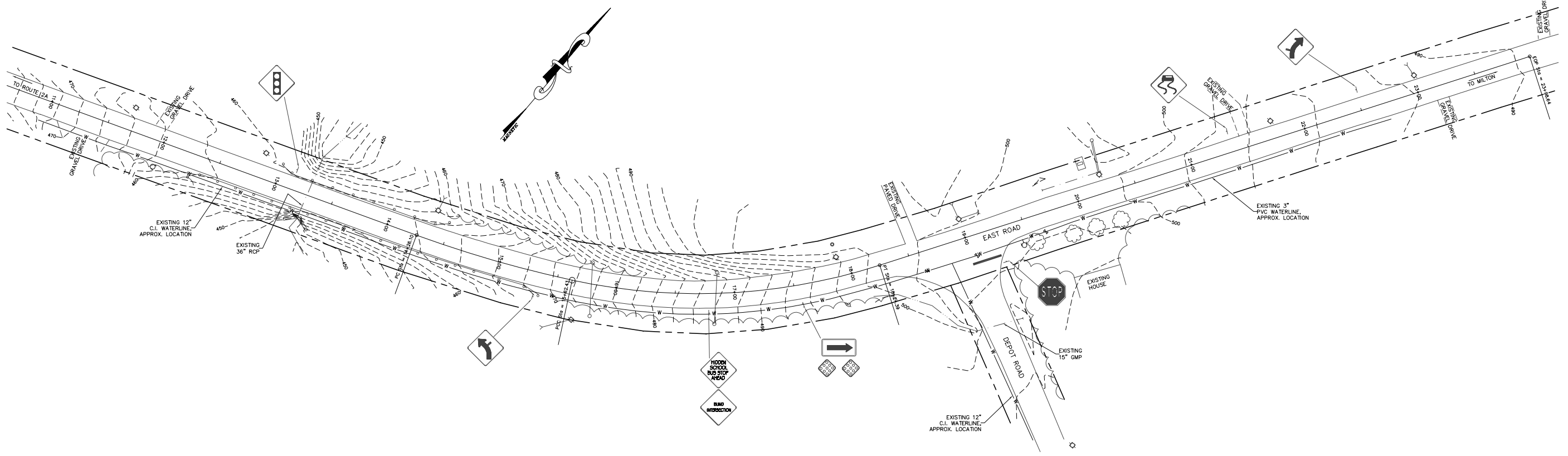
As this improvement alternative simply consists of the highlight of existing warning signs, the installation of new signs, and the implementation of a concentrated enforcement program, we do not envision any associated permit issues. All of the work will take place within the existing Town right-of-way.

G.2 Long Term Improvements

As the majority of the work items are anticipated to take place within the existing Town right-of-way, we also envision minimal permit issues associated with the long term improvements. Below is a list of the potential permit issues:

- Construction easements will be required for adjustment of the driveway across from Depot Road.
- Construction easements will be required for grading and drainage work in the southeast quadrant of the East/Depot Road intersection.
- The waterline modifications along East Road may require a permit from the Water Supply Division of the Vermont Agency of Natural Resources.
- No wetland impacts are anticipated as a result of this work.
- No Land Use permit is anticipated to be required as this work involves less than 10 acres.
- No Stormwater Discharge permit is anticipated as this work results in no increase in impervious area.

Appendix A



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Scale 1" = 40'

DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY

CLIENT

CHITTENDEN COUNTY METROPOLITAN PLANNING ORGANIZATION
100 DORSET STREET / SUITE 22
SOUTH BURLINGTON, VERMONT

PROJECT TITLE

EAST ROAD / DEPOT ROAD TECHNICAL ASSISTANCE STUDY

DRAWING TITLE

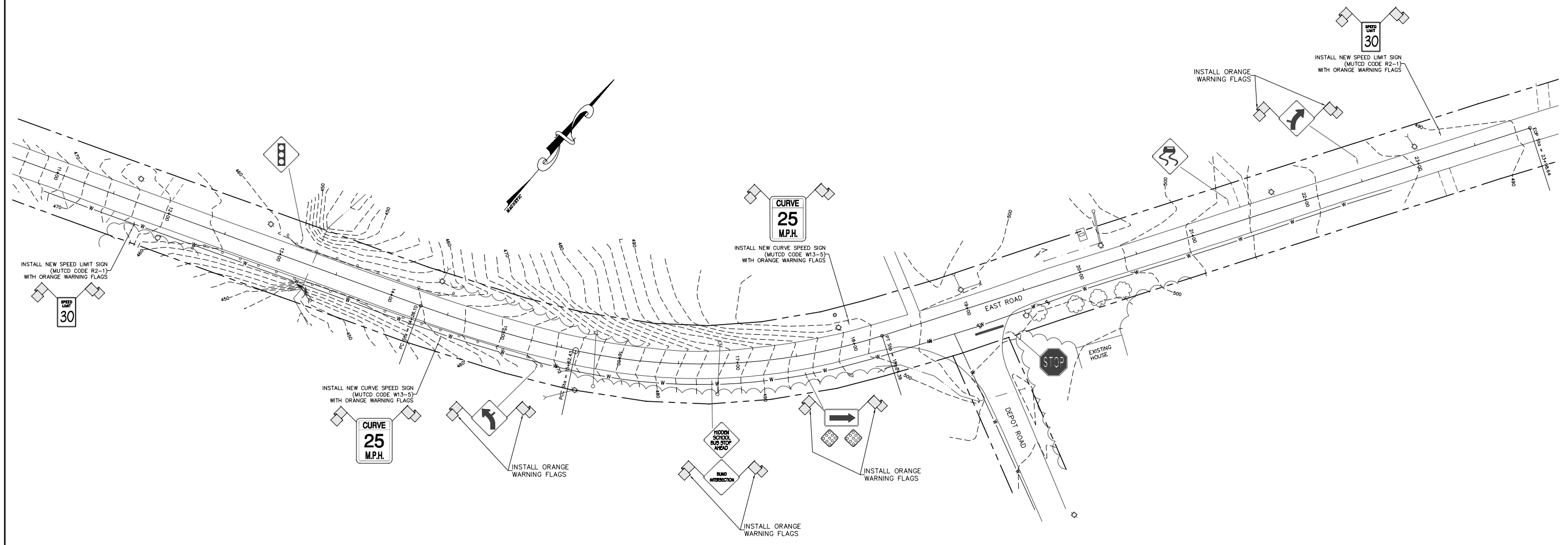
FIGURE 1
EXISTING CONDITIONS

Survey	MRM/TCR
Design	JPK
Drawn	JPK
Checked	RFH
Date	03/12/02

Donald L. Hamlin Consulting Engineers, Inc.
136 Pearl Street
Essex Junction, Vermont

Scale	1"=40'
Job	01-371
File	
Drawing	FIG-1

REDUCED PLAN



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DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
04/11/02	ADDED ORANGE WARNING FLAGS	JPK

CLIENT
CHITTENDEN COUNTY METROPOLITAN PLANNING ORGANIZATION
100 DORSET STREET / SUITE 22
SOUTH BURLINGTON, VERMONT

PROJECT TITLE
EAST ROAD / DEPOT ROAD
TECHNICAL ASSISTANCE STUDY

DRAWING TITLE
FIGURE 2
SHORT TERM IMPROVEMENTS

Survey	MRM/TCR
Design	JPK
Drawn	JPK
Checked	RFH
Date	03/12/02

Donald L. Hamlin Consulting Engineers, Inc.
136 Pearl Street
Essex Junction, Vermont

Scale	1"=40'
Job	01-371
File	
Drawing	FIG-2

REDUCED PLAN

REDUCED PLAN

DATE	REVISION	BY
04/11/02	SHOW NEW WATERLINE	JPK
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY
DATE	REVISION	BY

CLIENT
CHITTENDEN COUNTY METROPOLITAN PLANNING ORGANIZATION
100 DORSET STREET / SUITE 22
SOUTH BURLINGTON, VERMONT

PROJECT TITLE
EAST ROAD / DEPOT ROAD
TECHNICAL ASSISTANCE STUDY

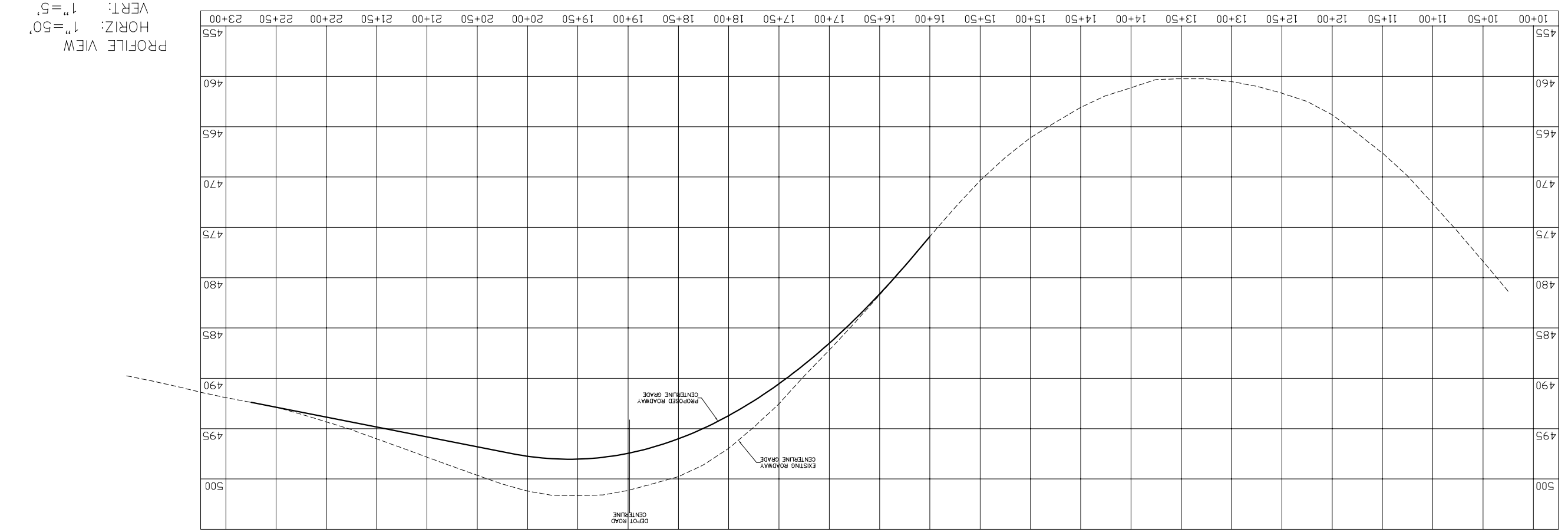
DRAWING TITLE
FIGURE 3
LONG TERM IMPROVEMENTS

Survey MRM/TCR
Design JPK
Drawn JPK
Checked RFH
Date 03/12/02

Donald L. Hamlin Consulting Engineers, Inc.
136 Pearl Street
Essex Junction, Vermont

Scale SHOWN
Job 01-371
File
Drawing FIG-3

PROFILE VIEW
HORIZ: 1"=50'
VERT: 1"=5'



PLAN VIEW
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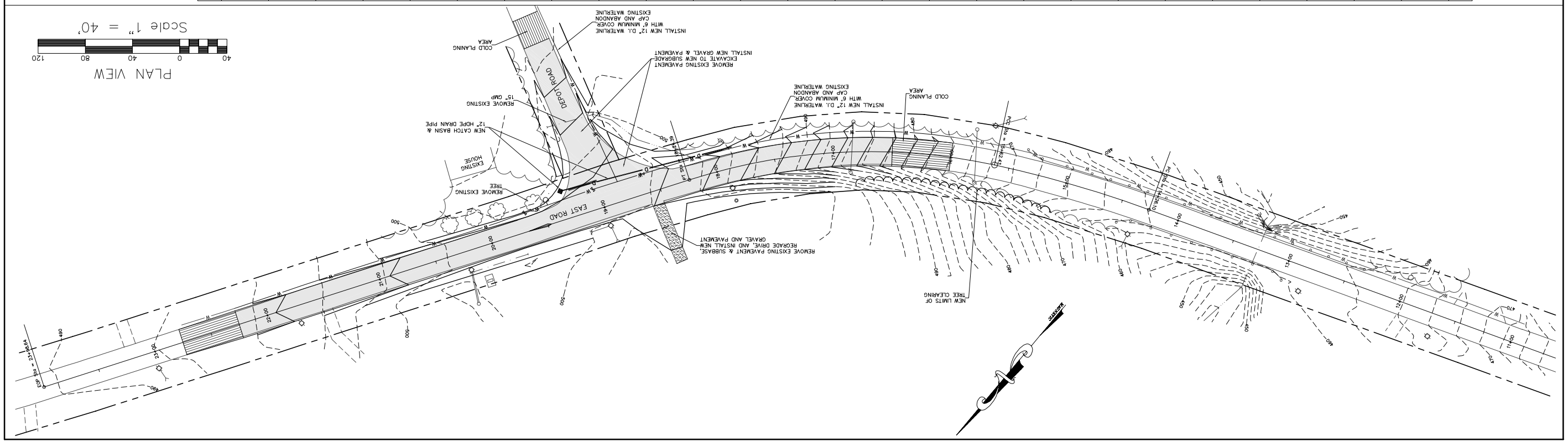

Appendix B

East/Depot Road Improvements
Colchester, Vermont
Conceptual Cost Estimate

Short Term Improvements

Revised: 04/11/02

	ITEM	QUANTITY	UNIT	PRICE	TOTAL
1)	New Signs	4	ea	$ 125.00	$ 500.00
2)	New Warning Flags	16	ea	$ 40.00	$ 640.00
3)				$ -	$ -
4)				$ -	$ -
5)				$ -	$ -
6)				$ -	$ -
7)				$ -	$ -
8)				$ -	$ -
9)				$ -	$ -
10)				$ -	$ -
11)				$ -	$ -
12)				$ -	$ -
13)				$ -	$ -
14)				$ -	$ -
15)				$ -	$ -
16)				$ -	$ -
17)				$ -	$ -
18)				$ -	$ -
19)				$ -	$ -
20)				$ -	$ -
	Contingency	---	---	0%	$ -

Subtotal	$ 1,140.00
Engineering	$ -
Construction Services	$ -
Total	$ 1,140.00

East/Depot Road Improvements
Colchester, Vermont
Conceptual Cost Estimate

Long Term Improvements Revised: 04/11/02

	ITEM	QUANTITY	UNIT	PRICE	TOTAL
1)	Remove Trees & Stumps	1	ls	$ 1,000.00	$ 1,000.00
2)	Cold Planing	326	sy	$ 1.77	$ 577.02
3)	Remove Existing Pavement	2,127	sy	$ 3.76	$ 7,997.52
4)	Remove Existing 15" GMP	40	lf	$ 7.60	$ 304.00
5)	Common Excavation	3,652	cy	$ 12.36	$ 45,138.72
6)	Fine Grading	2,127	sy	$ 0.65	$ 1,382.55
7)	Dense Graded Crushed Stone	790	cy	$ 21.32	$ 16,842.80
8)	Plant Mixed Gravel	423	cy	$ 20.54	$ 8,688.42
9)	Bituminous Concrete Pavement	504	tons	$ 50.00	$ 25,200.00
10)	New 12" D.I. Waterline	520	lf	$ 45.50	$ 23,660.00
11)	New 4" D.I. Waterline	310	lf	$ 24.70	$ 7,657.00
12)	New 12" Gate Valve	3	ea	$ 1,275.00	$ 3,825.00
13)	12" Wet Tap	2	ea	$ 2,700.00	$ 5,400.00
14)	4" Wet Tap	1	ea	$ 1,000.00	$ 1,000.00
15)	Reconnect Water Service	4	ea	$ 835.00	$ 3,340.00
16)	Relocate Hydrant	1	ea	$ 1,150.00	$ 1,150.00
17)	New Catch Basin	1	ea	$ 1,800.00	$ 1,800.00
18)	New 12" HDPE Drain Pipe	150	lf	$ 20.60	$ 3,090.00
19)	Topsoil, Seed, & Mulch	1,840	sy	$ 4.50	$ 8,280.00
20)	Dust Control	1	ls	$ 1,000.00	$ 1,000.00
21)	Traffic Control	1	ls	$ 1,000.00	$ 1,000.00
22)	Mobilization	1	ls	$ 5,000.00	$ 5,000.00
	Contingency	---	---	20%	$ 34,666.61

Subtotal	$ 207,999.64
Engineering	$ 14,559.97
Construction Services	$ 6,239.99
Total	$ 228,799.60